Remarks

Claims 5-12 are pending. Favorable reconsideration is respectfully requested.

The subject invention is directed to preparation of storage stable silicone emulsions. Such emulsions have been prepared by numerous methods, as described in the specification on pages 1-3. However, the particle size, particle size distribution, and storage stability, *inter alia*, are often unsatisfactory from batch to batch. Customers have exacting requirements regarding such properties, and emulsions which do not meet product specifications must be scrapped or reworked. Since silicones are relatively expensive, and as reworking, if possible at all, involves considerable cost (and ingenuity), it is highly desirable to provide a process which can be guaranteed to produce a within-spec product time after time.

Applicants have surprisingly and unexpectedly discovered that silicone emulsions meeting the above requirements can be met by a process using at least two high shear mixers in series, a highly viscous emulsion being formed in the first mixer, wherein a set point for each of temperature and pressure exiting each of the mixers is established, and process parameters are adjusted to maintain the temperature and pressure of the emulsion exiting the first mixer and the second mixer to maintain the emulsion at the respective set points.

Claims 5-6 and 12 have been rejected under 35 U.S.C. § 103(a) over Hosokawa et al. U.S. 5,563,189 ("*Hosokawa*; discussed on page 2, lines 26-30, of the specification) in view of Joffre et al. EP 0915122 A1 ("*Joffre*"). Applicants respectfully traverse this rejection.

The Office states that *Hosokawa* discloses a two stage mixture wherein A), B), and C) are fed to the first high shear mixer and optionally further A), B), and C) are further admixed. This is incorrect, as *Hosokawa* clearly discloses only one inlet and one outlet with a relaxation zone between the two mixing turbines.

Hosokawa does not disclose any temperature measurement. *Hosokawa* does disclose the pressures used, but only at the supply port and the discharge port, not any pressure after the first mixer, for example. Moreover, *Hosokawa* does not disclose adjusting any process parameters in view of measured temperature and pressure deviating from any set point. The pressures employed by *Hosokawa* appear only to be autogenous pressures (or lack thereof: 0.0 kg/cm^2!) *Hosokawa* does not indicate that either temperature or pressure have any effect on the quality of the product. *Hosokawa*'s product quality is stated to be achieved through the use of his special dual stage mixing turbine with its unique chamber/blade shapes, not monitoring and adjusting temperature or pressure. It is not even seen how pressure can be varied in *Hosokawa*'s apparatus, since the inlet pressures in both Examples are different, and the shear rates used in both are different, yet the outlet pressure was the same in both cases, 0.0 kg/cm^2.

Finally, it is noted that both turbines of *Hosokawa* are on the same shaft, and therefore both spin at the same speed. It is not possible to independently adjust the speed of the two turbines.

Joffre is cited as supplying the missing limitations of *Hosokawa*, but *Joffre* does not do so.

Joffre is directed to the formation of "precrosslinked" emulsions of a condensation-curable organopolysiloxane, a crosslinker for the organopolysiloxane, and water. Because the polymer and crosslinker react in the presence of water, they must be mixed quickly but thoroughly. To do so *Joffre* teaches that a premix of polymer and crosslinker be prepared in a first mixer, thus homogeneously blending these mutually soluble components, then feeding the premix to one or more high shear mixers where the outlet temperature is kept below 60°C, preferably not higher than 50°C, and more preferably not higher than 40°C. These are not "set points," but process maxima. *Joffre* teaches that going above these temperature maxima may be prevented by adjusting the speed of the second mixer.

The problem with the process of *Joffre* is that it ignores the realities of emulsion preparation. The emulsions of *Joffre* are less prone to separation because the dispersed droplets contain both polymer and crosslinker, and are suspended in an aqueous matrix which fosters condensation curing. *See, e.g. Joffre* at [0042] lines 52-55. The elastomers thus formed do not tend to coalesce until water is removed by evaporation. Coalescence to a film or shaped body (*i.e.* caulk or sealant) then occurs. High temperatures are avoided to prevent premature crosslinking, not for adjusting emulsion quality.

The Office's attention is directed, for example, to Applicants' examples and comparative examples. In Example 1, the temperature following the first mixer is 43.5°C and following the second mixer, 50°C, both within or touching *Joffre*'s more preferred range. The emulsion was storage stable at 50°C for several months. Comparative Example 1b was made from the same ingredients as Example 1, but the temperature following the first mixer was 20°C and the temperature following the second mixer was 25°C. Both these temperatures are within *Joffre*'s most preferred range (< 40°C), but the emulsion was turbid and separated after only three weeks. It was not stable.

The first and second mixer temperatures of Example 2 were 33°C and 35°C, and a third mixer was also employed, the temperature after the third mixer being 36°C. An emulsion which was stable for more than one year was produced. In Comparative Example 2b, the temperatures of the respective mixers were 45°C, 46°C, and 46°C. The product showed substantial decomposition after storage for only two weeks. Yet, these temperatures are still within *Joffre*'s preferred range.

Example 3 is most similar to *Joffre*'s compositions in that a curable (OH-terminated) silicone oil (but no crosslinker) is employed. The temperatures of the three mixers are 26°C, 37°C, and 27°C. The silicone oil feed temperature was 15°C. In Comparative Example 3b, the silicone oil temperature was 25°C, and an emulsion of similar particle size was obtained. However, the viscosity of the product was 40% lower than that of Example 3. In both cases, the temperatures were lower than the most preferred maximum (40°C) of *Joffre*.

These examples make clear, as is already known to one skilled in the art, that each different emulsion must be prepared under conditions ("set points") which must be established by prediction based on experience and then refinement under process conditions. Once these set points are established, the process is then run in accordance with Applicants' claims; the temperature and pressure following both the first and second mixers are measured and compared to the set points. If they vary, then process parameters such as inlet temperature, mixer 1 speed, mixer 1 pressure, mixer 2 speed, mixer 2 pressure, etc., are varied to return to the set point. *Joffre* does not disclose any set point; only operating maxima, and the only temperature recorded by *Joffre* is the outlet temperature, *i.e.* the temperature following *Joffre*'s last mixer.[1] *Joffre* does not disclose, teach or suggest measuring the temperature following both emulsion mixers. The Office cites [0042] for this proposition, but this paragraph only recites the outlet temperature following the last mixer (40°C; lines 52-53). In *Joffre*'s Example 2, the inlet temperature (25°C) and outlet temperature (32°C) are indicated, but no temperature following any of the intermediate mixers. Since *Joffre* did not measure these, he cannot teach adjusting them either.

Moreover, *Joffre* did not measure any pressure in his system, anywhere. Applicants' claims require monitoring both temperature and pressure following each mixer. *Joffre* does not teach or suggest this, and neither does the combination of *Joffre* with *Hosokawa*, who measured only inlet and outlet pressures.

Withdrawal of the rejection of claims 5-6 and 12 over *Hosokawa* in view of *Joffre* is respectfully solicited.

Claims 7 and 8 have been rejected under 35 U.S.C. § 103(a) over *Hosokawa* in view of *Joffre* further in view of Leong U.S. 5,296,166 ("*Leong*").

Contrary to the statement of the Examiner, *Hosokawa* does not indicate that pressure is a critical process parameter. In *Hosokawa*, the particular geometry of the two mixer

[1] The first "emulsion" mixer, *i.e.* the one following the "premix mixer," when two mixers are used, and the second "emulsion mixer" when three mixers are used.

mixing blades and the shear rate are the critical variables, not the pressure. *Hosokawa* measured the inlet and outlet pressures only, no pressure measurement was made after the first mixer. Nowhere does *Hosokawa* indicate that pressure is critical. If the Office disagrees, it is requested that the particular passage in *Hosokawa* be identified with clarity. The word "critical" is not found at column 7, lines 50-54, nor are any words of similar connotation. The passage cited never indicates any kind of criticality or even any importance of any pressure.

Claims 7 and 8 require the pressure after a high shear mixer to be adjusted by regulating the speed of the mixer. *Hosokawa* cannot do this, as the design of his mixer eliminates pressure as an independent variable. In his Example 1, the rate of shear was 93,000/70,000 s^{-1} respectively, in the two turbines (both are on the same shaft and must rotate at the same speed but have different geometries). In Example 2, the shear rates were 66,000/50,000 s^{-1} respectively, due to rotation at 3000 rpm rather than 4200 rpm in Example 1. Yet, in both cases the outlet pressure was zero. It is clear that in *Hosokawa*, pressure cannot be adjusted by varying the speed.

The Office cites *Leong* for the proposition that:

> The speed of shearing mixers is a significant factor in determining not just the temperature but the pressure of the stirred emulsions, and that hence the shearing speed is a variable necessary of adjustment in order to regulate the desired operating temperature and pressure (2:21 - 3:45).

Applicants have carefully reviewed the cited section of *Leong* and are unable to find any such disclosure. At column 3, lines 33-45, *Leong* states that high shear mixing is disadvantageous because of temperature increases, and indicates that cooling can be used to overcome this temperature increase, not changing the pressure or the shear rate. As a matter of fact, the entire passage cited by the Office is an admonition to avoid the use of high shear mixers altogether. The process of *Leong* uses only low shear mixing, *i.e.* hand stirring, propeller stirring, etc., as described in column 2, lines 31-63. Thus, any combination of *Leong* with *Hosokawa* or *Joffre* is impossible, as their teachings are diametrically opposed. *Hosokawa* and *Joffre* both require

high shear mixing, while *Leong* teaches against using high shear mixing. Teaching away is strong evidence of non-obviousness, *W.L. Gore v. Garlock*, 220 USPQ 303 (Fed. Cir. 1983), and *DuPuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 90 USPQ2d 1918 (Fed. Cir. 2009) ("An inference of nonobviousness is especially strong where the prior art's teachings undermine the very reason being proffered as to why a person of ordinary skill would have combined the known elements."). There is no evidence of any motivation to combine these references and in fact the references are uncombinable due to their opposing teachings. Finally, the premise of the Examiner that regulating the shearing speed will necessarily adjust the pressure is incorrect, as is well known. An increase in shearing speed may lower or raise pressure, or may not change the pressure at all. Other factors are involved and there is simply no direct relationship between shearing speed and pressure, which is shown by *Hosokawa*, where two very different shearing speeds had no effect on pressure. *Leong* does not teach or suggest regulating any parameter of a high speed mixer; he teaches avoiding such mixers altogether. Withdrawal of the rejection of claims 7 and 8 under 35 U.S.C. § 103(a) over *Hosokawa*, *Joffre*, and *Leong* is respectfully solicited.

Claims 9 and 10 have been rejected under 35 U.S.C. § 103(a) over *Hosokawa* in view of *Joffre* further in view of Schirosi et al. WO 02/42360 A2 ("*Schirosi*"). Applicants respectfully traverse this rejection.

Schirosi teaches regulating the temperature of the raw ingredients as a means of regulating the temperature of his mixing process. However, like *Hosokawa* and *Joffre*, *Schirosi* does not teach or suggest measuring the pressure after the first and second high shear mixers. Rather, *Schirosi* teaches measuring the inlet pressure in the supply line to the high shear mixer 9. The Office refers to [0037 - 0038] as disclosing such measurement, but it does not. *Schirosi*'s first high shear mixer is 9, and the pressure is measured before this mixer, not following the mixer. Mixer 4 is not a high shear mixer; it is a premixer such as used by *Joffre*. As can be seen, no water is fed to this mixer. The water is supplied by water supply line 8 to the first high shear mixer 9, not to the premixer.

Withdrawal of the rejection of claims 9 and 10 is respectfully solicited.

Claim 11 has been rejected under 35 U.S.C. § 103(a) over *Hosokawa* in view of *Joffre* further in view of *Leong* and further in view of *Schirosi*. None of the references teach or suggest the limitations of claims 5 or 7, from which claim 11 depends. Claim 11 is patentable for this reason alone. However, the combination of references fails to teach the additional limitations of claim 11. The cooling referred to by *Schirosi* is only for preventing premature reaction, not for producing a stable emulsion. *Schirosi* never measures the temperature at any point in the process. If the Office disagrees, it is requested that the appropriate passages be cited.

Withdrawal of the rejection of claim 11 is respectfully solicited.

Claims 5-6 and 12 have been rejected under 35 U.S.C. § 103(a) over *Joffre* in view of *Hosokawa*.

Neither *Hosokawa* nor *Joffre* or their combination disclose, teach, or suggest measuring both the temperature and the pressure following both high shear mixers, as discussed in detail previously. Withdrawal of this rejection is respectfully solicited.

Claims 7 and 8 have been rejected under 35 U.S.C. § 103(a) over *Joffre* in view of *Hosokawa* further in view of *Leong*. This combination of references has been thoroughly discussed previously. It matters not which reference is the principle reference, as neither of the references or any combination thereof teach or suggest either the limitations of the base claims nor the additional limitation of claims 7 and 8. Withdrawal of this rejection is respectfully solicited.

Claims 9 and 10 have been rejected under 35 U.S.C. § 103(a) over *Joffre* in view of *Hosokawa* further in view of *Schirosi*. This combination of references has been thoroughly discussed previously. It matters not which reference is the principle reference, as neither of the references or any combination thereof teach or suggest either the limitations of the base claims

nor the additional limitation of claims 9 and 10. Withdrawal of this rejection is respectfully solicited.

Claim 11 has been rejected under 35 U.S.C. § 103(a) over *Joffre* in view of *Hosokawa* further in view of *Leong* further in view of *Schirosi*. This combination of references has been thoroughly discussed previously. It matters not which reference is the principle reference, as neither of the references or any combination thereof teach or suggest either the limitations of the base claims nor the additional limitation of claim 11. Withdrawal of this rejection is respectfully solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, he is highly encouraged to telephone Applicants' attorney at the number given below.

Please charge any fees or credit any overpayments as a result of the filing of this paper to our Deposit Account No. 02-3978.

Respectfully submitted,

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